Tropilaelaps Mites
2024 United States Primer:

WHERE WE ARE, WHAT YOU CAN DO,
AND WHERE WE ARE GOING

Project Apis m.
POLLINATOR PARTNERSHIP

Apiary Inspectors of America

AUBURN UNIVERSITY

HONEY BEE HEALTH COALITION

USDA

What are *Tropilaelaps* Mites?

Tropilaelaps mites form a destructive mite complex that includes four recognized species (*Tropilaelaps mercedesae, T. clareae, T. koenigerum, and T. thaii*) that are found primarily in Asia, where their original hosts, the giant honey bees (*Apis dorsata* and *Apis laboriosa*), exist. Two species – *T. mercedesae* and *T. clareae* – are known to infest colonies of the Western honey bee (*Apis mellifera*).

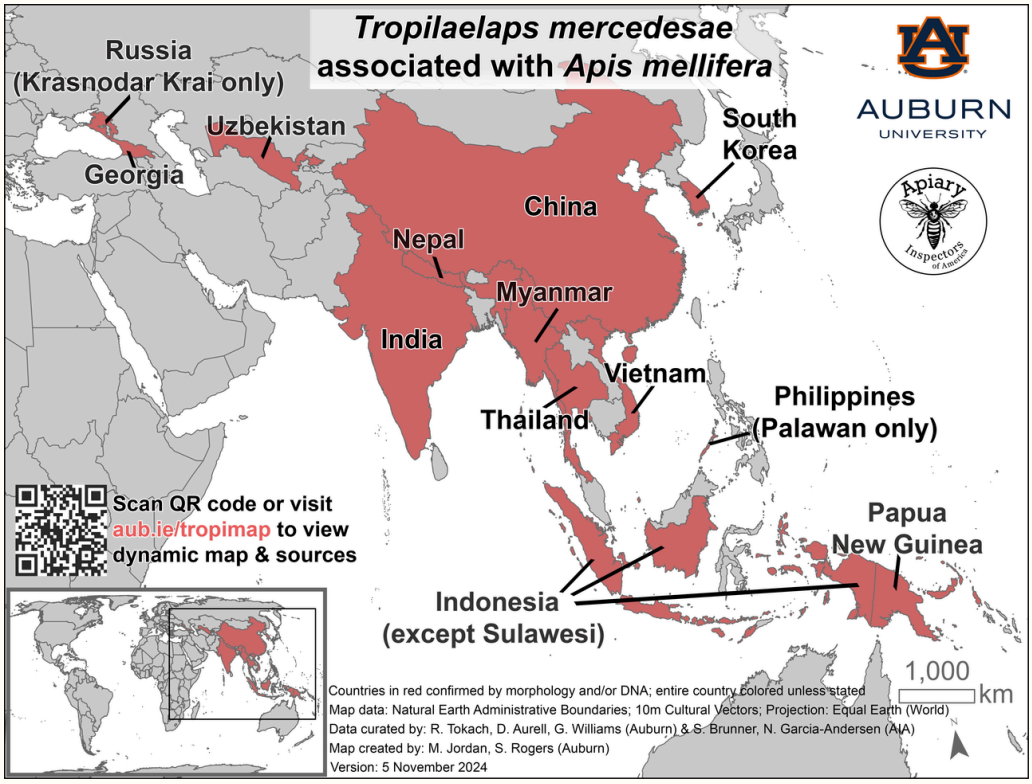
While *Tropilaelaps* is thought to cause little harm to the giant honey bees, *T. mercedesae* specifically is a major pest of Western honey bees managed by beekeepers in Asia. *Tropilaelaps* has been identified by the World Organization for Animal Health (WOAH) as a reportable disease of honey bees.

What is the current distribution or geographic range of *Tropilaelaps?*

The current range of *Tropilaelaps* mites, especially at the periphery of its range, is not well-known. It is expected that they occur in areas where giant honey bees are found. Locations where *T. mercedesae* exist are most relevant to beekeepers in the United States, since this is the only Tropilaelaps species known to widely infest colonies of Western honey bees. *T. mercedesae* has also expanded beyond the range of its original Asian honey bee hosts.

Most recently, peer-reviewed studies have used molecular and morphological techniques to document *T. mercedesae* associated with Western honey bee colonies in Georgia,[1] Russia,[2] and Uzbekistan.[3]

Researchers are actively working to substantiate the presence and distribution of *Tropilaelaps* in other areas that are suspected to be impacted.



Are *Tropilaelaps* mites considered a risk for *Apis mellifera?*

Yes, *Tropilaelaps,* especially *T. mercedesae,* present a major threat to Western honey bees as they cause problems for beekeepers in countries where the mite is already present. Therefore, similar impacts would be expected for the beekeeping industry in the United States if they were to become established.

Since **Western honey bees contribute $15 billion to the United States economy annually** through the pollination of crops and honey production, **the prevention of a *Tropilaelaps* infestation in North America is paramount.**

T*ropilaelaps* mites feed on the hemolymph of developing worker and drone honey bees. It is believed that, similar to the *Varroa destructor* mite, *Tropilaelaps* also vector a complex of viruses, such as deformed wing virus, that impact the health of developing bees within the colony. It appears unlikely that the mouthparts of the mite can penetrate the exoskeleton of an adult bee or the skin of alternative hosts. It is believed that *Tropilaelaps* requires access to honey bee brood to survive and reproduce. This reliance on access to brood has been hypothesized as a barrier which has historically confined the mite to areas of Southeast Asia where the tropical weather allows for year-round brood production. Despite this constraint, the mite has recently expanded to areas with cooler winter conditions, and wider infestation may occur in the future because of climate change.

While *Tropilaelaps* are not known to feed on adult honey bees, they can attach to adults, which likely assists its dispersal between colonies. It is believed that *Tropilaelaps* cannot survive more than 6 days without brood,[4] but this is an area of active research. For this reason, the ability of *Tropilaelaps* to disperse via shipment of packages or queens should not be excluded.

Another significant threat from *Tropilaelaps* is its ability to reproduce quickly. *Tropilaelaps* does not require a phoretic period on adults; they are able to emerge from one brood cell and immediately enter another cell for another round of reproduction. Consequently, *Tropilaelaps* has been reported to reproduce faster than *Varroa* in Western honey bee colonies. This allows *Tropilaelaps* to rapidly build to damaging levels.

How can I identify *Tropilaelaps* in my honey bee colony?

Visual identification of *Tropilaelaps* is more challenging than *Varroa* identification due to its size.

To the naked eye, all four *Tropilaelaps* species are similar in size – about 1/3 the size of *Varroa*. Detection methods vary in sensitivity. All options require some training and any finds should be verified by an expert at the USDA. In addition, many of the visual signs of a high *Tropilaelaps* infestation can easily be confused with signs of *Varroa* mite infestation and/or other bee pathogens, like bald brood or cell uncapping.

Photo: Female *Varroa destructor* left and female *Tropilaelaps mercedesae* right.

Given the potential for missed occurrences, continual monitoring is critical to supporting early detection and effective treatment of the pest. *Tropilaelaps* is most likely to first arrive in the country on honey bees through a port of entry (e.g., airport; harbor). However, the first detection in the country could be anywhere. It's possible that *Tropilaelaps* could be present for some time before it's detected. Therefore, **vigilance is essential to early detection and control.**

Genetic screening of hive material has also been evaluated, although some variation in the sensitivity of these detection methods has been noted. Furthermore, additional research on best detection methods is essential, as is the need to understand mite dispersal (i.e., how mites move from colony to colony) and the potential for *Tropilaelaps* to persist on alternative hosts

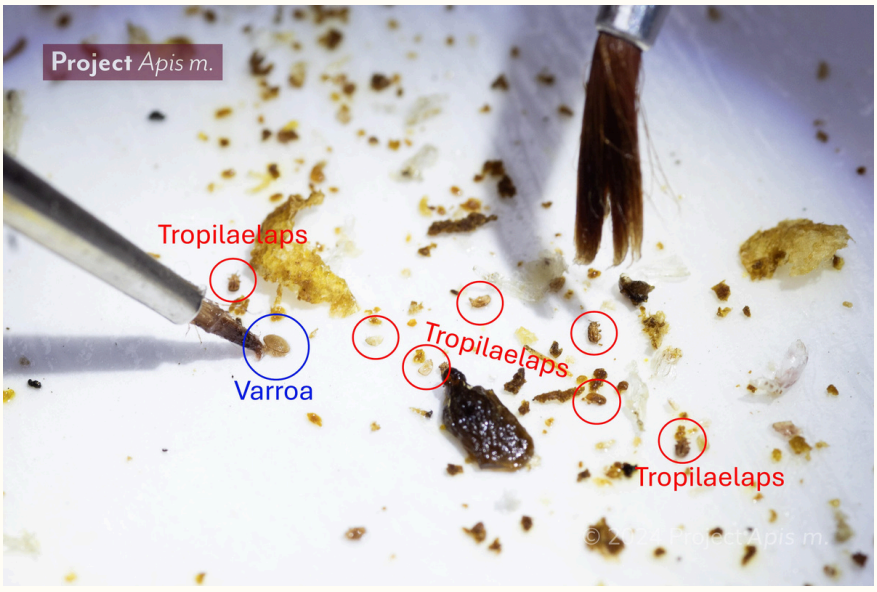


Photo: *Tropilaelaps mercedesae* on a sticky board.

Examples of types of methods used for detection [5]

Method	Description
Bump **Moderate** sensitivity **Moderately** fast	**This method is used by the national survey.** A brood frame containing older larvae or emerging brood is bumped several times on a collection surface to dislodge *Tropilaelaps* mites. Collection surfaces can include a table covered with white paper, or a white metal pan. The collected material (bee larvae and other debris) can be examined with a magnifying glass in the field, or taken to a lab for examination under a microscope.
Sticky Board **High** sensitivity Time-**consuming**	Sticky boards placed at the bottom of the hive can be used to collect *Tropilaelaps* that naturally drop from the colony. Commercial sticky boards or boards smeared with a sticky material like petroleum jelly are used to capture fallen mites over 24-72 hours. To prevent bees from interfering with collected material, the sticky boards are protected with 8-mesh screen. Sticky boards can be examined under a microscope or with an illuminated magnifying glass.
Examining Brood Cells **High** sensitivity Time-**consuming**	Brood can be examined by opening 100–200 capped worker brood cells and removing the brood. The brood and the inside of the cells are examined for *Tropilaelaps* under good illumination.
Powdered Sugar **Low** sensitivity **Fast**	Powdered sugar can be used to dislodge *Tropilaelaps* mites from adult bees. A ½-cup sample of bees (about 300 bees) is collected from brood frames with older larvae or emerging bees and placed into a jar with a screened lid. After coating the bees with powdered sugar, the jar is inverted and shaken vigorously for one minute over a white collection surface. Water from a spray bottle is used to dissolve the powdered sugar and make it easier to find any dislodged mites.
Soapy Water or Alcohol Wash **Low** sensitivity **Fast**	Soapy water or alcohol can be used to dislodge *Tropilaelaps* mites from samples of adult bees. The bees are collected into a jar containing soapy water or alcohol (minimum 35% ethanol or isopropyl alcohol) and shaken for one minute. The bees and wash solution are poured through an 8-mesh screen into a white-colored pan, allowing any mites to pass into the pan. *Tropilaelaps* mites are spotted in the pan or when the wash solution is strained through a fine screen to capture any mites (holes smaller than 300 microns, or 0.3 mm).

What should I do if I suspect the presence of *Tropilaelaps?*

There are many other look-alike species of mites that can be present in a honey bee colony. Suspect *Tropilaelaps* samples should be submitted for official confirmation by the USDA following the state/territory's normal procedures for official confirmation.

If a *Tropilaelaps* infestation is suspected, the beekeeper should reach out to their state apiary inspector. If your state does not have a state apiary inspector or they cannot be reached, the collector can contact their state's Plant Regulatory Official. They will take a sample for further analysis and identification by the USDA. Once confirmed by the USDA, USDA-APHIS and the affected state(s) will work together to determine the next steps. After alerting regulatory authorities, beekeepers can also submit samples to the National Agricultural Genotyping Center for molecular identification.

Tropilaelaps Look-Alikes

Photo: Adult male *Varroa destructor* mite. Photograph by Giles St. Martin.

Bees are associated with over 700 species of mites from 236 genera. Given the high diversity in bee-associated mites, and their cosmopolitan distribution, it is likely that a number of mites can be observed associated with the Western honey bee. Some of these mites may resemble Tropilaelaps.

Most look-alikes are not thought to negatively impact the health of honey bee colonies. Recently, one species from the mite genus *Macrocheles,* the *M. muscadomesticae* house fly mite, has been observed in honey bee colonies in the United States.

Other potential look-alikes include: male or immature *Varroa* mites, pollen mites, and the bee louse (*Braula spp.*).

If there is a possibility that an observed mite is *Tropilaelaps,* beekeepers should contact their state apiary inspector immediately.

Potential control methods

For management of *Tropilaelaps,* the USDA and EPA remind the beekeeping community that existing registered options for *Varroa* control could potentially be effective options. Under FIFRA Section 2(ee), the federal statute for EPA regulation of pesticides, it is not required to have *Tropilaelaps,* specifically *T. mercedesae,* listed as a specific mite on the label. Any miticide products that are used properly in accordance with label directions (i.e. are labeled for use in bee colonies to kill mites), restrictions, and application parameters could be used to control *Tropilaelaps;* note that while FIFRA 2(ee) ensures legality of registered products at the federal level, state regulations may be more restrictive.

Currently registered active ingredients for *Varroa* control include formic acid, oxalic acid, hops beta acids, amitraz, tau-fluvalinate, and coumaphos; however, research is still determining the efficacy of many of these products in controlling *Tropilaelaps*. As an alternative to chemical treatments, brood breaks (removing developing bees from a colony) have proven effective against *Tropilaelaps*. Brood breaks exploit *Tropilaelaps*' dependence on brood and cause mite starvation when larvae or pupae are not present in the colony.

Thus far, research has shown formic acid and brood breaks to be the most promising treatments against *Tropilaelaps*.

Overall, control of *Tropilaelaps* will require a coordinated effort through the state and federal government with rigorous monitoring needed to tailor response and prevent further movement of the mite.

What is being done to prepare for a potential infestation of *Tropilaelaps?*

The USDA has assembled a team of university and government scientists, non-government organizations (NGO's), and beekeeping stakeholders who have been meeting to coordinate research and information sharing. This will help prepare the United States to be vigilant and proactive in identifying *Tropilaelaps* and understanding options for controlling this pest.
USDA-APHIS does not allow importation of bees from any country with honey bee colonies known to be infested with *Tropilaelaps*. Since 2009, USDA-APHIS has funded an annual National Honey Bee Pests and Diseases Survey; one of the target pests of the survey is *Tropilaelaps*. In 2024, Auburn University hosted a *Tropilaelaps w*orkshop to train state apiary inspectors.

Further resources

Further resources providing information about *Tropilaelaps* biology and management can be found at:

- Pollinator Partnership's TropiStop: tropistop.com
- Apiary Inspectors of America and Auburn University's Tropi Resources: honeybeepests.org/tropi
- Project Apis M.'s *Tropilaelaps* Training Documentary Series: https://bit.ly/PAmTropiDoc2024
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